BAR CODE MED ADMIN (BCMA)

Technical Manual/Security Guide

Version 1.0

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Department of Veterans Affairs
V*IST***A** Technical Services

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1 INTRODUCTION

1.1 Overview

BCMA software is a point-of-care solution for validating the administration of medications. The initial software development and hardware research done at the Eastern Kansas Health Care System, Colmery-O'Neil Division, VISN 15, Heartland Veterans Health Network, is the basis from which the standard product is being built. The existing software functionality, in addition to enhancements identified by a functional workgroup with Nursing and Pharmacy representatives from various Veterans Integrated Services Networks (VISNs), is being replicated with a graphical user interface (GUI) (MS Windows-based) client/server architecture.

Automation of the medication administration process will improve medication administration accuracy and increase the efficiency of documentation. As each patient wristband and medication is scanned by a bar code reader, the software will validate that the medication is ordered, timely, and in the correct dosage—as well as electronically update the medication administration history. BCMA software offers a tool to augment, not replace, the clinical judgment of the medication administrator.

1.2 Features of BCMA

BCMA:

- Increases medication administration accuracy
- Captures drug accountability data
- Increases the information available to Nursing staff at the patient point of care
- Reduces wasted medications
- Improves communication between Nursing and Pharmacy staffs
- Provides a real-time Virtual Due List of orders for medication administration
- Records refused medications
- Records missing doses and sends the requests electronically to the Pharmacy
- Provides a point-of-care data entry/retrieval system
- Provides full compatibility with the existing **V***IST***A** system
- Identifies PRN entries that require effectiveness comments
- Replaces the manual Medication Administration Record (MAR) with a Medication Administration History (MAH) to provide an automatic record of a patient's medication administration information
- Provides a list of variances that identify early or late medication administrations and late PRN effectiveness entries

1.3 Scope

This document briefly describes the technical and security aspects of BCMA Version 1.0. It is intended for members of the Automated Data Processing (ADP)/Information Resources Management (IRM) staff who have had experience with other Veterans Health Information Systems and Technology Architecture (**V***IST***A**) software and have worked or will work with a package coordinator who is familiar with the functions of the Medication Administration in a Veterans Affairs Medical Center (VAMC). Readers without this background are referred to the documentation for the Kernel, the VA FileMan, and BCMA V. 1.0 user manuals. (See Section 1.4, Related Documentation, for a list of BCMA V. 1.0 materials and their Intranet address.)

A number of site parameters allow the individual VAMCs to define the package to meet local needs. The user manuals describe these site parameters and the ways they influence the operation of the package.

This version of BCMA can only be run in an environment that already has several existing features, such as a standard MUMPS operating system. It also requires the following VA application software and all current patches to the versions:

Package	Minimum Version Needed
Toolkit	7.3
Kernel	8.0
VA FileMan	21.0
MailMan	7.1
CPRS	1.0
32 bit RPC Broker	1.1
Nursing	4.0

The above software is not included in BCMA V. 1.0 and must be installed before this version of BCMA is completely functional.

1.4 Related Documentation

The following documentation has been developed for BCMA V. 1.0:
Bar Code Med Admin V. 1.0 User Manuals
Bar Code Med Admin V. 1.0 Installation Guide
Bar Code Med Admin V. 1.0 NVS Manual

Documentation and additional information for this product—including background, technical and procurement information—can now be found on the Intranet at the following address:

http://www.vista.med.va.gov/bcma

2 ORIENTATION

2.1 On-Line Help and Documentation

Throughout the entire BCMA package, you are able to enter a question mark (?) in the character-based user interface (CHUI) options and F1 in the GUI options to obtain on-line information to help you in your choice of actions at any prompt.

Additional information about this package is contained in help prompts and comments which are available on-line. Detailed information can also be obtained by using the Kernel routine XINDEX to produce detailed listings of the routines and by using the VA FileMan to generate listings of data dictionaries for the files.

The Data Dictionaries (DDs) are considered part of the on-line documentation for this software application. Use VA FileMan option *List File Attributes* [DILIST], under *Data Dictionary Utilities* [DI DDU], to print the DDs.

3 IMPLEMENTATION AND MAINTENANCE

3.1 Resource Requirements

BCMA V. 1.0 contains 25 routines.

Response Time monitor hooks have not been placed in BCMA V. 1.0.

This package requires four files, described in Section 4.0, Files, in this manual. A typical site might require 215 bytes of disk space for every med pass. Therefore, you might expect BCMA to require about 1 MB of disk space for every 4000 med passes.

The requirements for laptops and scanners depend upon the number of inpatient areas using BCMA. In general, three laptops and three scanners for each ward are considered the minimum. Each facility also requires printers for wristbands, bar code labels, and missing dose requests.

3.2 Options to be Deleted during Install

None

3.3 Templates to be Deleted during Install

None

3.4 Routines to be Deleted during Install

None

4 FILES

This package requires the following four files:

```
^PSB(53.68,   BCMA MISSING DOSE REQUEST
^PSB(53.69,   BCMA REPORT REQUEST
^PSB(53.78,   BCMA MEDICATION VARIANCE LOG
^PSB(53.79,   BCMA MEDICATION LOG
```

See also Section 13.5, File Security. For information about the files, use the VA FileMan to generate a list of file attributes.

The namespace for the BCMA package is PSB.

The DDs are considered part of the on-line documentation for this software application. Use VA FileMan option *List File Attributes* [DILIST], under *Data Dictionary Utilities* [DI DDU], to print the DDs.

5 ROUTINE LIST

The following is a list of routines you will see for BCMA when you load the new routine set. The first line of each routine contains a brief description of the general function of the routine.

Use the Kernel option XU FIRST LINE PRINT (*First Line Routine Print*) to print a list of the first line of each PSB* routine.

```
PSBMD     PSBML     PSBMLEN   PSBMLTS   PSBMLU    PSBO      PSBOBL    PSBODL
PSBOHDR   PSBOMD    PSBOMH    PSBOML    PSBOMM    PSBOMV    PSBOPE    PSBORL
PSBOWA    PSBPAR    PSBPRN    PSBRPC    PSBSAGG   PSBUTL    PSBVAR    PSBVDL
PSBVDL1

     25 routines
```

6 EXPORTED OPTIONS

6.1 Menu Assignments

Unless menus have already been assigned, the menu PSB MANAGER should be assigned to the package coordinator for BMCA. The menu PSB PHARMACY should be assigned to all pharmacists and the menu PSB NURSING should be assigned to all nurses and other personnel who may administer medication. In addition, anyone passing meds with the GUI application will need the PSB GUI CONTEXT - USER

6.2 Security Key

Following is a list of the security keys:

PSB MANAGER	Assign to the package coordinator
PSB STUDENT	Assign to all Students
PSB INSTRUCTORS	Assign to all nursing instructors supervising students

6.3 Package Security

Electronic signatures may be established by using the Kernel option, *Electronic Signature code Edit* [XUSESIG].

In Kernel V. 8.0 the *Electronic Signature code Edit* [XUSESIG] option has been tied to the Common Options, under the *User's Toolbox* [XUSERTOOLS] submenu, for easy access by all users.

7 ARCHIVING AND PURGING

Detailed information is kept for each inpatient, including all information about administered medications and PRN effectiveness. An average record requires about 215 bytes (0.3 Kbytes) of disk storage. Archive and purge are not available in this release of the software but are necessary to the product. Archive and purge features shall be consistent with Computerized Patient Record System (CPRS). Once CPRS has developed an archive and purge feature, BCMA will develop one.

8 CALLABLE ROUTINES

No routines are designated as callable from outside of this package.

9 EXTERNAL RELATIONS

The following software is not included in this package and must be installed before this version of BCMA is completely functional.

Package	Minimum Version Needed
Toolkit	7.3
Kernel	8.0
VA FileMan	21.0
MailMan	7.1
CPRS	1.0
32 bit RPC Broker	1.1
Nursing	4.0

9.1 Database Integration Agreements (DBIAs)

BCMA V. 1.0 has Database Integration Agreements (DBIAs) with Inpatient Medications, Nursing, and Registration. For complete information regarding the DBIA for BCMA V. 1.0, please refer to the *DBA* [DBA] menu option on FORUM and then the *Integration Agreement Menu* [DBA IA ISC].

10 INTERNAL RELATIONS

ALL options in this package can be invoked independently.

11 PACKAGE-WIDE VARIABLES

None

12 TEMPLATES

SORT	FILE
NONE	
INPUT	FILE
None	
PRINT	FILE
None	

13 SOFTWARE PRODUCT SECURITY

13.1 Archiving/Purging

Archiving and purging are not available in BCMA V. 1.0.

13.2 Electronic Signatures

Electronic signatures may be established by using the Kernel option, *Electronic Signature code Edit* [XUSESIG]. In Kernel V. 8.0 the *Electronic Signature code Edit* [XUSESIG] option has been tied to the Common Options, under the *User's Toolbox* [XUSERTOOLS] submenu, for easy access by all users.

13.3 Menu Assignments

The menu PSB MANAGER should be assigned to the Package Coordinator BCMA.
The menu PSB PHARMACY is assigned for all inpatient pharmacists.
The menu PSB NURSE is assigned for all nurses.

13.4 Security Keys

PSB MANAGER This key should be assigned to the package coordinator, and all appropriate members of the ADP/IRM staff.

PSB INSTRUCTOR This key is assigned to users that will be co-signing for students passing meds.

PSB STUDENT This key automatically requires an instructor to sign on with the student.

13.5 File Security

This package requires four files in addition to those of the Kernel and other files to which it points, for example the PATIENT file (#2). Information about all files, including these can be obtained by using the VA FileMan to generate a list of file attributes.

File Numbers	File Names	DD	RD	WR	DEL	LAYGO
53.68	BCMA MISSING DOSE REQUEST	@		@	@	@
53.69	BCMA REPORT REQUEST	@		@	@	@
53.78	BCMA MEDICATION VARIANCE LO	@		@	@	@
53.79	BCMA MEDICATION LOG	@		@	@	@

Please refer to page 432 of Kernel V. 8.0 Systems Manual concerning installation of security codes sections entitled Sending Security Codes.

14 BAR CODE MED ADMIN V. 1.0 MENU DIAGRAMS

Three main menus are exported with the package. The *Manager* menu [PSB MGR] should be assigned to supervisors, package coordinators and members of the ADP/IRM staff. Pharmacists should have the *Pharmacist Menu* [PSB PHARMACY] and Nurses should have the *Menu* [PSB NURSE].

14.1 Nursing Medication Administration Menu(PSB NURSE)

Medication Administration Log
Missed Medications
Edit Medication Log
Ward Administration Times
Due List
PRN Effectiveness List
Enter PRN Effectiveness
Manual Medication Entry
Medication Administration History (MAH)
Missing Dose Request

Medication Variance Log
Drug File Inquiry

14.2 Pharmacy Medication Administration Menu

Medication Administration Log
Missed Medications
Due List
Medication Administration History (MAH)
Missing Dose Request
Missing Dose Followup
Missing Dose Report
Label Print
Drug File Inquiry

14.3 Manager Menu

Drug File Inquiry
Edit Divisional Parameters
Medication Administration Menu Nursing
    Medications Administration Log
    Missed Medications
    Edit Medication Log
    Ward Administration Times
    Due List
    PRN Effectiveness List
    Enter PRN Effectiveness
    Manual Medication Entry
    Medication Administration
    History (MAH)
    Missing Dose Request
    Medication Variance Log
    Drug File Inquiry
Medication Administration Menu Pharmacy
    Medication Administration Log
    Missed Medications
    Due List
    Medication Administration History (MAH)
    Missing Dose Request
    Missing Dose Followup
    Missing Dose Report
    Label Print
    Drug File Inquiry
    Missing Dose Followup
Reset User Parameters
Trouble Shoot Med Log

15 ROUTINE MAPPING

We make no recommendations for routine mapping. However, if you choose to map the BCMA V. 1.0 package routines, you will need to bring the system down and then restart to load the new routines into memory.

16 JOURNALING GLOBALS

The primary global used by BCMA V. 1.0 is ^PSB. Journaling is recommended.

17 BAR CODES

BCMA V. 1.0 includes the ability to print bar codes for labeling ward stock. There is one option that utilizes the bar codes.

Label print [PSBO BL] is intended to be used to print individual or batch bar codes. This option is specifically coded to the Zebra brand printers using ZPL command language. The model used in development of the labels was the 105SE. The routine PSBOBL can be modified to use site specific printers or terminal types to produce labels.

18 GLOSSARY

This section contains acronyms and definitions of terms used in this manual.

ADP	Automated Data Processing
Archive	Prescriptions, typically those which have been expired or canceled for more than a year, can be saved to tape, and then purged from on-line storage.
BCMA	Bar Code Med Admin
CHUI	Character-based user interface
CPRS	Computerized Patient Record System. CPRS is a Graphical User Interface (GUI) in **V***IST***A** that provides order entry and results reporting for multiple packages.
DBIA	Database Integration Agreement
DD	Data Dictionary
DHCP	See **V***IST***A**.
GUI	Graphical user interface
IRM	Information Resources Management
MAH	Medication Administration History
MAR	Medication Administration Record
MB	Megabyte
PRN	Pro re nata (Latin for "as needed")
Purge	Prescriptions, typically those which have been expired or canceled for more than a year, are saved to tape. Purging removes them from on-line storage.
VAMC	Veterans Affairs Medical Center
VISN	Veterans Integrated Services Network
V*IST*A	Acronym for **V**eterans Health **I**nformation **S**ystems and **T**echnology **A**rchitecture, the new name for Decentralized Hospital Computer Program (DHCP).

APPENDIX A—SOFTWARE BUSINESS RULES

1 TIMING ISSUES

1.1 Application Startup

The system will compare the client clock (date/time) with the server clock (date/time), at application startup. If there is a difference greater than the **PSB SERVER CLOCK VARIANCE** parameter value, a warning message will display. All client date/time calculations will be based on the client clock plus a client-server increment.

1.2 Virtual Due List Time Range

The Virtual Due List (VDL) will display from the top of the nearest hour (i.e., 1:15a.m. = 1:00 a.m. and 1:45a.m. = 2:00a.m.) for 12 hours back and 12 hours forward.

2 MEDICATION ROUTES

For medications with a Route of IV, IM, or SC, the user will be required to enter an injection site. Other routes will not have this requirement.

3 SCHEDULE TYPES

Bar Code Medication Administration uses four standard Schedule Types released with Pharmacy Inpatient Medications V. 5.0. These are Continuous, PRN, One-Time, and On-Call. A schedule type of Fill on Request is converted to either a Continuous or PRN, depending on whether the schedule contains the characters "PRN."

3.1 Continuous

3.1.1 Definition

A Continuous order has rigid, scheduled administration times running for a fixed length of time as defined by the order start and stop date/times.

3.1.2 First Dose Rule

The first dose is always due on the start date of the order. If the date/time due is before the start date/time of the order, the dose will not be allowed to be given. Example: Place a Q48H or QOD order with an administration time of 0900, and the order start date is Monday @ 1330. The first dose is due Monday @ 0900, but can not be given because the order is not active at that time. The next dose is due Wednesday @ 0900.

3.1.3 VDL Placement Rule

This order will be placed on the VDL once for each administration time that falls within the last 12hrs and the next 12hrs. A QD@0900-1200-1500-1800 will appear four times with dates depending on NOW. If NOW = 2300 then t@1200, t@1500, t@1800, and ***t+1@0900*** orders will appear.

3.1.4 Administration Rule

The order will be checked at the instant of administration for already Given, Discontinued, Do Not Give, or Expired. If the order is okay, the window of administration will be applied. If NOW is within the window-of-administration, the entry will be logged as Given. If NOW is not within the window-of-administration, the clinician must confirm the administration and provide a

comment before the order will be logged. In the last case, a variance will be filed, if the order is Given.

3.2 PRN

3.2.1 Definition

A PRN order is given as needed, without rigid, defined administration times, for a fixed length of time as defined in the order start and stop date/times.

3.2.2 First Dose Rule

The first dose is allowed anytime after the start date/time and before the stop date/time of the order.

3.2.3 VDL Placement Rule

The order will be placed on the VDL once if the start date/time is before NOW and the stop date/time is greater than NOW.

3.2.4 Administration Rule

The order will be checked at the instant of administration for already Given, Discontinued, Do Not Give, or Expired. If the order is okay, the last four administrations of this order will be displayed. The user must then confirm that they wish to give the medication and provide a reason. An alert will be displayed if the time since the previous administration of this order is less than 4 hours. This is required since the Last Given column of the VDL is not order-specific.

3.3 One-Time

3.3.1 Definition

A One-Time order is given one time. The timeframe is defined in the parameter file by days. For example, if the parameters state 2 days, then the medication must be given either today or tomorrow.

3.3.2 First Dose Rule

The first dose is defined in Section 3.3.1, Definition.

3.3.3 VDL Placement Rule

The order will be placed on the VDL for the duration of the timeframe expressed in the definition. Once the order is marked as Given, Refused, or Held, it is removed from the VDL and is accessible only via the CHUI administration edit screen.

3.3.4 Administration Rule

The order will be checked at the instant of administration for already Given, Discontinued, Do Not Give, or Expired. If the order is okay, the user will be allowed to administer the medication.

3.4 On-Call

3.4.1 Definition

An On-Call order is given one time and one time only within the timeframe established by the order start date/time and stop date/time.

3.4.2 First Dose
The first dose may be given anytime within the order start and stop date/times.

3.4.3 VDL Placement Rule
The order will be placed on the VDL for the duration of the order start and stop date/times. Once marked Given, Refused, or Held, it is removed from the VDL and is accessible only via the CHUI administration edit screen.

3.4.4 Administration Rule
The order will be checked at the instant of administration for already Given, Discontinued, Do Not Give, or Expired. If the order is okay, the user will be allowed to administer the medication.

4 MEDICATION LOG ENTRIES
4.1 Definition of an Entry
All drugs in File #50 have a Dispense Unit field with data in it. This is used against the Units Per Dose field in the Dispense Drug field of the order file when the unit starts with Tab or Cap. All other medications will prompt the user for the units given.

4.2 Server to Client Format of Orders
All data is sent to the client via the RPC 'PSB GETORDERSLIST', which returns all active orders for the current patient. The data is received to the client in the following format.

Results[0] Node Count
Results[1,6,…] Piece 1 DFN
Piece 2 Order Number
Piece 3 Order IEN
Piece 4 Order Type (V = IV, U = Unit Dose)
Piece 5 Schedule Type (C=Continuous, P=PRN, O=One-Time, OC=On-Call)
Piece 6 Schedule
Piece 7 SelfMed
Piece 8 Orderable Item
Piece 9 Dosage
Piece 10 Medication Route
Piece 11 FM Date/Time Last Given
Piece 12 MedLog IEN (If already given for this admin time, else null)
Piece 13 MedLog Given Status (G=Given, H=Held or R=Refused)
Piece 14 Scheduled Administration Date/Time
Piece 15 Orderable Item IEN
Piece 16 Injection Site Needed (0=False, 1=True)
Piece 17 Variable Dose Order (0=False, 1=True)
Piece 18 Administration Unit

Results[2,7,…] Special Instructions
Results[3,8,…] Dispense Drugs
Results[4,9,…] IV Solutions

Results[5,10,…] IV Additives

4.3 Client to Server Format of Orders

All filing is handled according to the business rules on the server. The RPC 'PSB TRANSACTION' returns either '1^Data Filed' or '-1^reason for not filing data' to the client. No other access to the Medication Log is available to the client.

Business rules are conducted via the [0] node data. If a '+1^MEDPASS' is encountered, it indicates a complete new medication pass and is validated as such. Transaction type MEDPASS is the only type that allows a +1 in the first piece of the header; all other transactions MUST supply a valid MedLogIEN value.

The data for filing is passed in as a list in Param[1] as shown below.

Example Delphi Call

```
with RPCBroker1 do
begin
RemoteProcedure := 'PSB TRANSACTION';
Param[0].Value := '88484^COMMENT';
Param[0].PType := Literal;
Param[1].Mult[0] := 'Comment for the medication pass';
Param[1].Ptype := List;
Call;
end;
```

4.3.1 Transaction: MEDPASS

Note: Entries 0-4 are required, 5 6 7 are required depending on item 2 (order type), 8 and 9 are reserved, and 10..n are medications.

[0] = Patient IEN

[1] = IV/Unit Dose Order Number
Note: will be passed in as Internal Entry Number (ien)V for IV and ienU for Unit Dose.

[2] = Schedule Type
Note: C: Continuous P: PRN O: One Time OC: On Call

[3] = Scan Status
Note: G: Given H: Held R: Refused

[4] = Orderable Item IEN
Note: IEN to 'PHARMACY ORDERABLE ITEM' (#50.7)

[5] = Scheduled Administration Date/Time

Note: The time the medication is scheduled to be given in the order. All medications are entered as given NOW.

[6] = Reason Given PRN
Note: Reason is required if given PRN; otherwise it must be blank.

[7] = User Comment
Note: 1-150 characters Free Text

[8] = Injection Site
Note: 1-30 characters Free Text

[9] = **Reserved**

[10..n]= Record Type^IEN^Units Ordered^Units Given^Units Type

Record Type =
DD: Dispense Drug
SOL: Solution
ADD: Additive

IEN = Internal Entry Number of the following
if Record Type = DD: DRUG (FILE #50)
SOL: IV SOLUTIONS (FILE #??)
ADD: IV ADDITIVES (FILE #??)

Units Ordered = Number of units in the Inpatient Medications Order

Units Given = Number of units scanned/entered by the user

Units Type = Type of administration unit (i.e. TAB, CAPLET, ML) can be used as passed in if not null

4.3.2 Transaction: COMMENT

[0] = User Comment to append to the log entry
Note: Will be appended to the log with User IEN and NOW as a date

4.3.3 Transaction: PRN EFFECTIVENESS

[0] = Effectiveness Comment
Note: will be filed as entered now by current user

4.3.4 Transaction: UPDATE STATUS

[0] = New Status
Note: If status is Given, Date/Time administered will be set to NOW. If status is Held or Refused, administration D/T will be set to null. Status on the medication log must be <> null to execute. New status must NOT match current status or G will overwrite administration D/T.

[1] = User Comment or Reason Held/ Refused.
Note: Comment is required